

**What is claimed is:**

1           1.    A wire grid polarizer with double metal layers,  
2 comprising:

3           a transparent substrate;

4           an array of parallel and elongated dielectric layers formed  
5                 on the transparent substrate, wherein the dielectric  
6                 layers have a period and a trench is located between  
7                 adjacent dielectric layers;

8           a first metal layer having a first thickness formed in the  
9                 trench; and

10          a second metal layer having a second thickness and a width  
11                 formed on each dielectric layer, wherein the first  
12                 and second metal layers are separated by a vertical  
13                 distance;

14          wherein the period is not greater than 250nm;

15          wherein the first thickness is not greater than 150nm and  
16                 is equal to the second thickness;

17          wherein the vertical distance is not greater than 100nm;

18          wherein the ratio of the width to the period is in a range  
19                 of 25~75%.

1           2.    The wire grid polarizer according to claim 1, wherein  
2 the transparent substrate is exposed in the trench.

1           3.    The wire grid polarizer according to claim 1, wherein  
2 a remaining dielectric layer is formed on a bottom of the trench.

1           4.    The wire grid polarizer according to claim 1, wherein  
2 a thickness of the transparent substrate is 500~1500nm.

1           5.     The wire grid polarizer according to claim 4, wherein  
2     the transparent substrate is a glass or plastic substrate.

1           6.     The wire grid polarizer according to claim 1, wherein  
2     the dielectric layers are PMMA (polymethylmethacrylate) layers.

1           7.     The wire grid polarizer according to claim 1, wherein  
2     the first metal layer is an Au, Ag, Cu or Al layer.

1           8.     The wire grid polarizer according to claim 1, wherein  
2     the second metal layer is an Au, Ag, Cu or Al layer.

1           9.     The wire grid polarizer according to claim 1, wherein  
2     the first and second metal layers comprise the same material.

1           10.    The wire grid polarizer according to claim 1, further  
2     comprising:  
3           a protective layer formed on the first and second metal  
4           layers.

1           11.    The wire grid polarizer according to claim 10, wherein  
2     the protective layer is a SiO<sub>2</sub>, SiN or SiON layer.

1           12.    The wire grid polarizer according to claim 1, wherein  
2     the period is in a range of 10~250nm.

1           13.    The wire grid polarizer according to claim 1, wherein  
2     the first or second thickness is in a range of 30~150nm.

1           14.    The wire grid polarizer according to claim 1, wherein  
2     the vertical distance is in a range of 10~100nm.

1           15.    A wire grid polarizer with double metal layers,  
2     comprising:

3           a transparent substrate;  
4           an array of parallel and elongated dielectric layers formed  
5                 on the transparent substrate, wherein the dielectric  
6                 layers have a period and a trench is located between  
7                 adjacent dielectric layers;  
8           a first metal layer having a first thickness formed in the  
9                 trench; and  
10          a second metal layer having a second thickness and a width  
11                 formed on each of the dielectric layers, wherein a  
12                 vertical distance is between the first and second  
13                 metal layers;  
14          wherein the period is in a range of 10~250nm;  
15          wherein the first thickness is in a range of 30~150nm and  
16                 is equal to the second thickness;  
17          wherein the vertical distance is in a range of 10~100nm;  
18          wherein the ratio of the width to the period is in a range  
19                 of 25~75%.

1           16. The wire grid polarizer according to claim 15, wherein  
2           the transparent substrate is exposed in the trench.

1           17. The wire grid polarizer according to claim 15, wherein  
2           a remaining dielectric layer is formed on a bottom of the trench.

1           18. A method of forming a wire grid polarizer with double  
2           metal layers, comprising the steps of:  
3                 providing a transparent substrate;  
4                 forming an array of parallel and elongated dielectric layers  
5                         on the transparent substrate, wherein the dielectric  
6                         layers have a period and a trench is located between  
7                         adjacent dielectric layers;

8           forming a first metal layer having a first thickness in  
9           the trench; and  
10          forming a second metal layer having a second thickness and  
11           a width on each dielectric layer, wherein the first  
12           and second metal layers are separated by a vertical  
13           distance;  
14          wherein the period is in a range of 10~250nm;  
15          wherein the first thickness is in a range of 30~150nm and  
16           is equal to the second thickness;  
17          wherein the vertical distance is in a range of 10~100nm;  
18          wherein the ratio of the width to the period is in a range  
19           of 25~75%.

1          19. The method according to claim 18, the transparent  
2          substrate is exposed in the trench.

1          20. The method according to claim 18, wherein a remaining  
2          dielectric layer is formed on a bottom of the trench.

1          21. The method according to claim 18, further comprising  
2          the step of:  
3           forming a protective layer on the first and second metal  
4           layers.

1          22. The method according to claim 18, wherein the  
2          dielectric layers are formed by photolithography or nanoimprint.